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STATE OF ALASKA

William A. Egan, Governor

Alaska Department of Fish and Game

Walter Kirkness, Commissioner

Sport Fish Division

Alex H. McRea, Director

ANNUAL REPORT OF PROGRESS, 1961-1962

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-3

SPORT FISH INVESTIGATIONS OF ALASKA

Richard Haley, Coordinator, Juneau
Robert Baade, Fishery Biologist, Ketchikan
Roger Wadman, Fishery Biologist, Wrangell
Jeremy Sexsmith, Fishery Biologist, Kodiak
Sidney Logan, Fishery Biologist, Seward
Frank Stefanich, Fishery Biologist, Anchorage
Edward J. Cramer, Fishery Biologist, Anchorage
Rupert E. Andrews, Fishery Biologist, Palmer
George Van Wyhe, Fishery Biologist, Glennallen
Henry J. McKirdy, Fishery Biologist, Fairbanks

INTRODUCTION

This report of progress consists of the job completion reports from the State of Alaska Federal Aid in Fish Restoration Project F-5-R-3, "Sport Fish Investigations of Alaska."

The current project is composed of twenty separate studies and was designed to evaluate the various aspects of the State's recreational fishery resources. The information gathered will provide the necessary background data for better management practices and for the development of future studies. During the current segment, continued emphasis was placed on the overall inventory and cataloging of accessible waters, evaluation of catch data, and investigations on various species of fish.

As a result of several problems of immediate concern, several new studies were instigated during the report year. Data accumulated from these studies has helped solve some problems in projects already in progress.

The population of Alaska is increasing rapidly and this is being reflected in the ever increasing number of "No Trespassing" signs put up by individuals in the vicinity of population centers. Fortunately, much of Alaska's fishery waters are still in the public domain. The division's program of acquiring access to fishing waters continued at a much faster pace since being instigated in 1959. Emphasis is being placed on this job and the successful continuation of this activity will forstall many serious recreational use problems currently facing other states.

The enclosed progress reports are fragmentary in many respects and the interpretations contained therein are subject to re-evaluation as the work progresses.

JOB COMPLETION REPORT

RESEARCH PROJECT SEGMENT

State: ALASKA

Project No: F-5-R-3 Name: Sport Fish Investigations of Alaska

Job No: 7-B-1 Title: Silver Salmon Studies in the Resurrection Bay Area

Period Covered: July 1, 1961 to June 30, 1962

Abstract:

Data was obtained on the distribution, timing, and abundance of silver salmon in the Resurrection Bay drainages. A semi-voluntary creel census was conducted from July 11 to September 9 providing an estimate of harvest and effort by sport fishermen. An estimate of the commercial silver salmon harvest in Resurrection Bay was also obtained. A weir was installed on Bear Creek and data was collected on timing and abundance of all salmonid species migrating into Bear Lake. Foot surveys provided minimum escapement data on silver salmon for all streams except the Resurrection River.

Recommendations:

1. Retain the present objectives of the study.

2. Determine the timing and abundance of out-migrant silver salmon at the Bear Creek weir. These outmigrants should be marked by fin clipping to provide an estimate of the total Resurrection Bay adult run and to obtain data on ocean mortality.

3. Further explore the possibilities of increasing the rearing potential of Bear Lake for juvenile silver salmon by rehabilitation and subsequent restocking.

Objectives:

To collect and analyze biological data concerning the distribution, abundance and timing of adult and juvenile silver salmon in the Resurrection Bay area.

To determine the age composition of these adult and juvenile silver salmon.

To determine the sport and commercial harvest of silver salmon in Resurrection Bay.

To investigate the environmental limitations of the juvenile silver salmon in this system.

To determine the methods and means of increasing or extending the fresh water rearing areas of the watershed.

Techniques Used:

During most of the silver salmon sport fishing period a semi-voluntary creel census was undertaken to provide data on harvest and effort. Boats were contacted by census clerks in the Seward small boat harbor and on Resurrection Bay. For each boat contacted the following information was collected: (1) number of anglers in boat; (2) number of silver salmon caught; (3) number of other salmon caught; (4) time fishing started; (5) number of local residents; (6) number of years anglers fished in Resurrection Bay. At the termination of the interview one serially numbered card was issued per boat with the following questions printed on it: (1) number of salmon caught; (2) time fishing stopped. On the various docks in the small boat harbor seven brightly painted boxes were placed for card deposition. Each card also had the address of the local office and could be mailed if accidentally taken home by the angler. Due to the larger volume of contacts which were available in the small boat harbor the interviews on the Bay were later discontinued. The census was active on all weekends, holidays and on one-half of the randomly selected weekdays. To obtain an estimate of the number of boats not contacted during the creel census, aerial boat counts were made at least twice a week.

Escapement counts were made on all streams entering Resurrection Bay. On the glacial portion of the Resurrection River aerial surveys were attempted with a Piper Super Cub along with limited gill netting and electrofishing. Foot surveys were made on all other streams with the following information collected: (1) number of live fish; (2) number of spent dead fish; (3) number of dead fish not spent. All dead fish were mutilated to avoid recounting in subsequent surveys. A weir was constructed on Bear Creek to provide data on the timing and abundance of all salmonid species using Bear Lake.

Silver Salmon at the Bear Creek weir and at the small boat harbor were weighed, measured, sex determined and scales collected. No age analyses were conducted during this segment of the study.

Findings:

The silver salmon is one of the most important sport fishes on the Kenai Peninsula. Since 1956 there has been a progressively increasing sport fishery for this species in Resurrection Bay. This expanded angling pressure has been brought about chiefly through the efforts of the Seward Chamber of Commerce which initiated the Seward Silver Salmon Derby in 1956. Table 1 shows the ticket sales for the Derby. The streams entering Resurrection Bay were, reportedly, heavily fished for silver salmon prior to their being closed to all salmon fishing in 1960. A minor commercial fishery exists on Resurrection Bay which primarily utilizes pink salmon, chum salmon, and silver salmon. In recent years the number of commercially caught silver salmon has been declining (Fig.1). No data on the past sport harvest is available but local fishermen claim silver salmon are not as abundant as in former times. To evaluate the status of this fishery the Alaska Department of Fish and Game initiated a long term investigation in 1959. This report describes the work completed during the 1961 segment of the project.

Resurrection Bay is on the southeastern edge of the Kenai Peninsula. The bay is about 3 miles wide and nearly 10 miles long with depths in excess of 150 fathoms. Seward, the main center of population, lies at the head of Resurrection

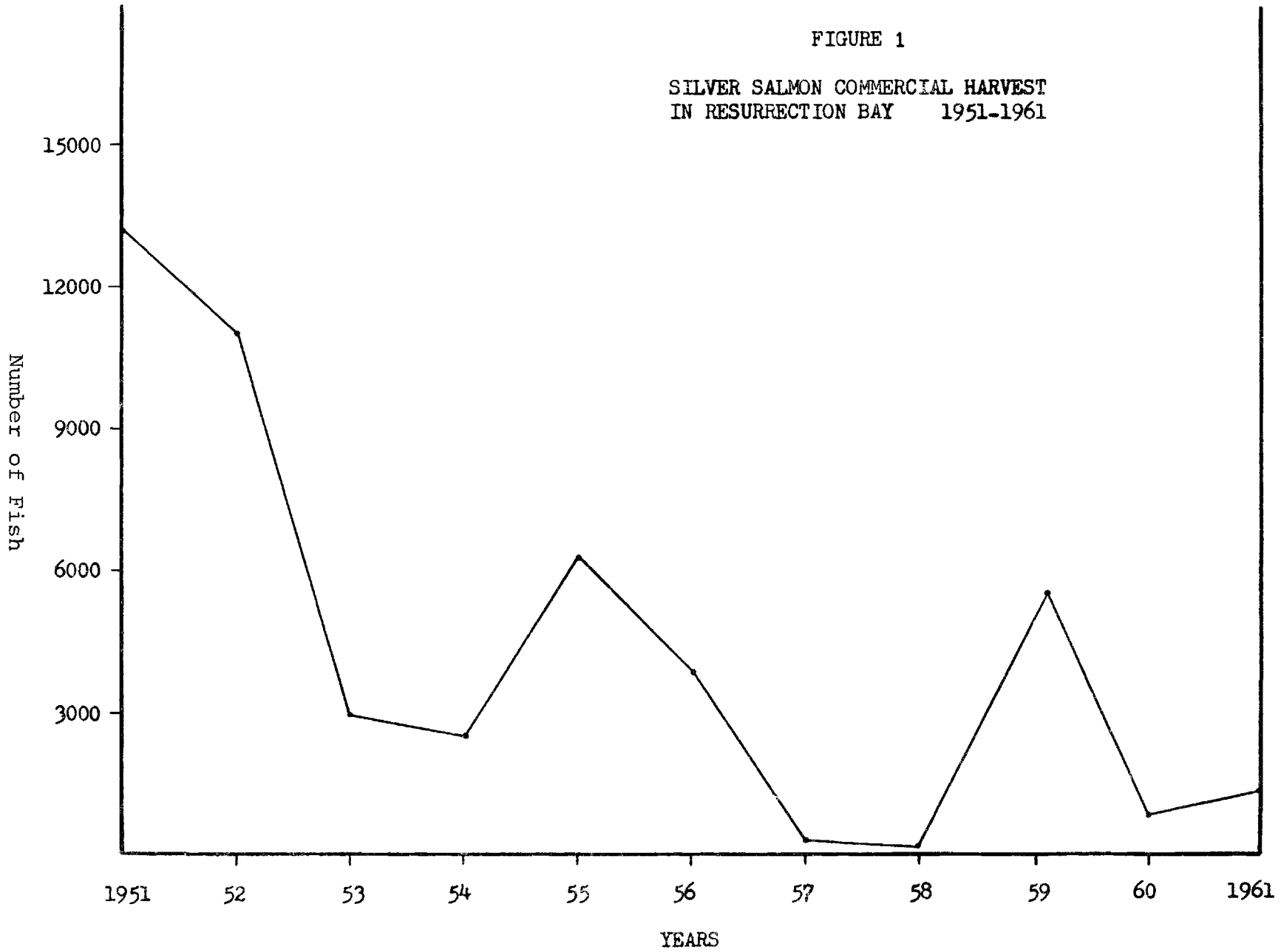
TABLE 1.

TICKET SALES FOR THE
SEWARD SILVER SALMON DERBY, 1956-1961

Year	Number of Participants
1956	1100
1957	1400
1958	1562
1959	2273
1960	1700
1961	2200

FIGURE 1

SILVER SALMON COMMERCIAL HARVEST
IN RESURRECTION BAY 1951-1961



Bay and is accessible from Anchorage via a hard surfaced road, railroad, and commercial airline. The area surrounding Resurrection Bay is mountainous with numerous large glaciers. The average annual precipitation at Seward is 60.8 inches and the mean annual air temperature is 39.4°F. The heaviest period of precipitation occurs in August (8.7 inches) and September (8.9 inches) with a decline in June to 1.8 inches. A map of the Resurrection Bay watershed is presented in Figure 2.

The major drainage system for Resurrection Bay is the Resurrection River which is a bridled glacial stream. The river is characterized by frequent channel changes and rapidly fluctuating water levels. Salmon Creek, its chief tributary, joins the river in the intertidal zone. This stream has more stable flows and is confined mainly to one channel. The chief sources of water for Salmon Creek are Bear Lake (402 acres), Grouse Lake (20 acres), Lost Lake (unsurveyed), and Clear Creek.

Sport fishing regulations now in effect on Resurrection Bay limit the daily catch to six silver salmon. All streams tributary to the Bay are closed to salmon fishing. Sport fishing methods are limited to hook and line.

Commercial salmon fishing regulations are more liberal in some respects and more restrictive in others. Hand purse seines, beach seines, and gill nets are permitted four days each week south of the line illustrated in Figure 2. Commercial trolling is prohibited in the Bay. Subsistence fishing (no limit) is permitted in all areas open to commercial fishing. The commercial season customarily opens August 1 but both the opening and closing dates are subject to field announcement.

The Resurrection Bay creel census was conducted from July 11 to September 9. The first silver salmon were caught about July 1 and there was still some limited fishing until the end of September. The weekly silver salmon sport harvest and effort is presented in Figure 3. The sport fishing catch of silver salmon, based on 2,884 anglers contacted, is estimated at 5,054 fish. The peak of the sport fishing harvest was during the first weekend of the Silver Salmon Derby (August 12 and 13) when an estimated 1,338 fish were taken. The influence of this four day Derby is shown by the estimated harvest of 2,138 fish (42.3% of the entire sport fish catch) during this

FIGURE 2

RESURRECTION BAY WATERSHED

1. Salmon Creek
2. Bear Creek
3. Grouse Creek
4. Lost Creek
5. Airport Creek
6. Jap Creek
7. Dairy Creek
8. Bear Lake
9. Grouse Lake
10. Seward
11. Resurrection River
12. Seward-Anchorage Road
13. Resurrection Bay
14. Commercial Fishing Line
15. Clear Creek

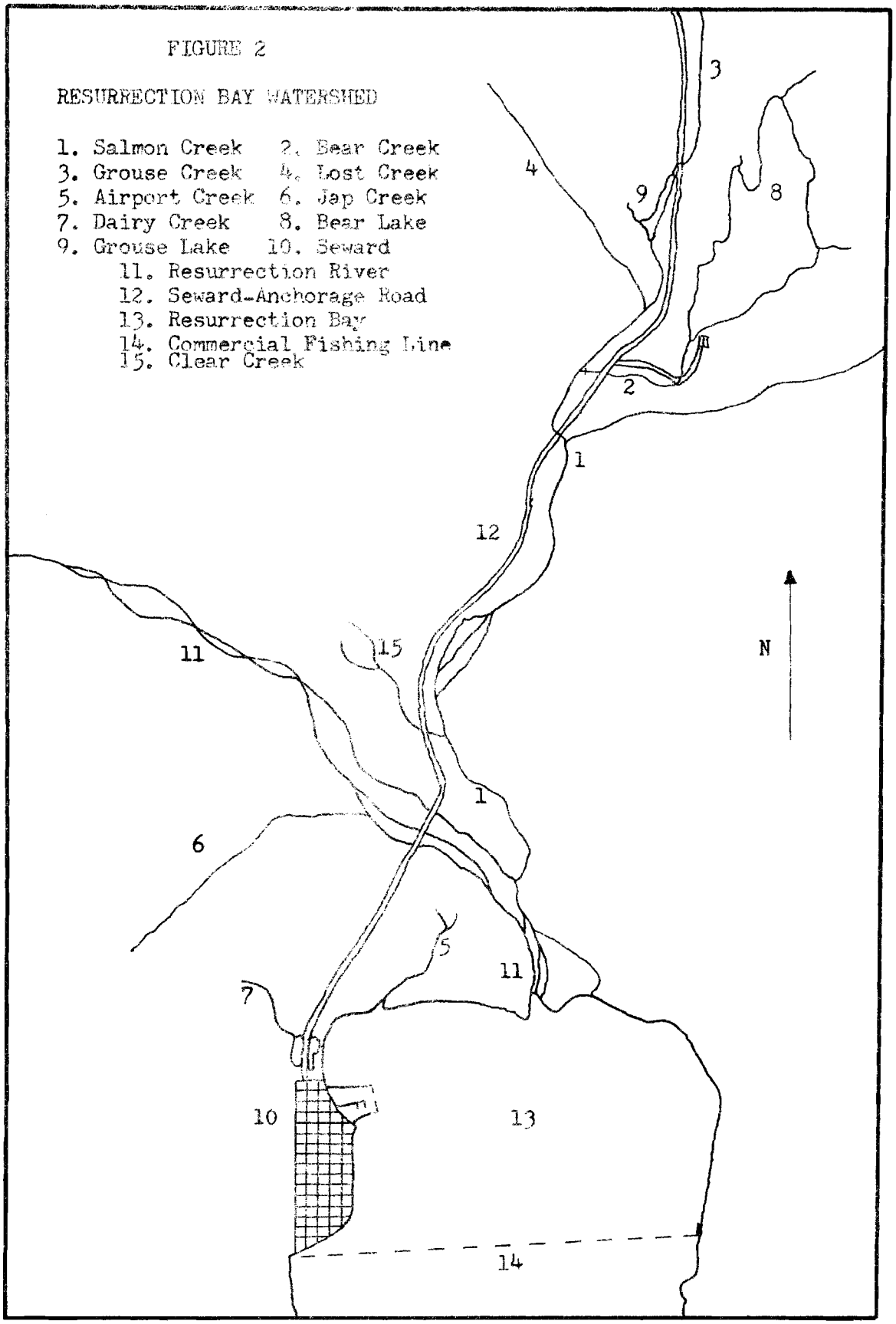
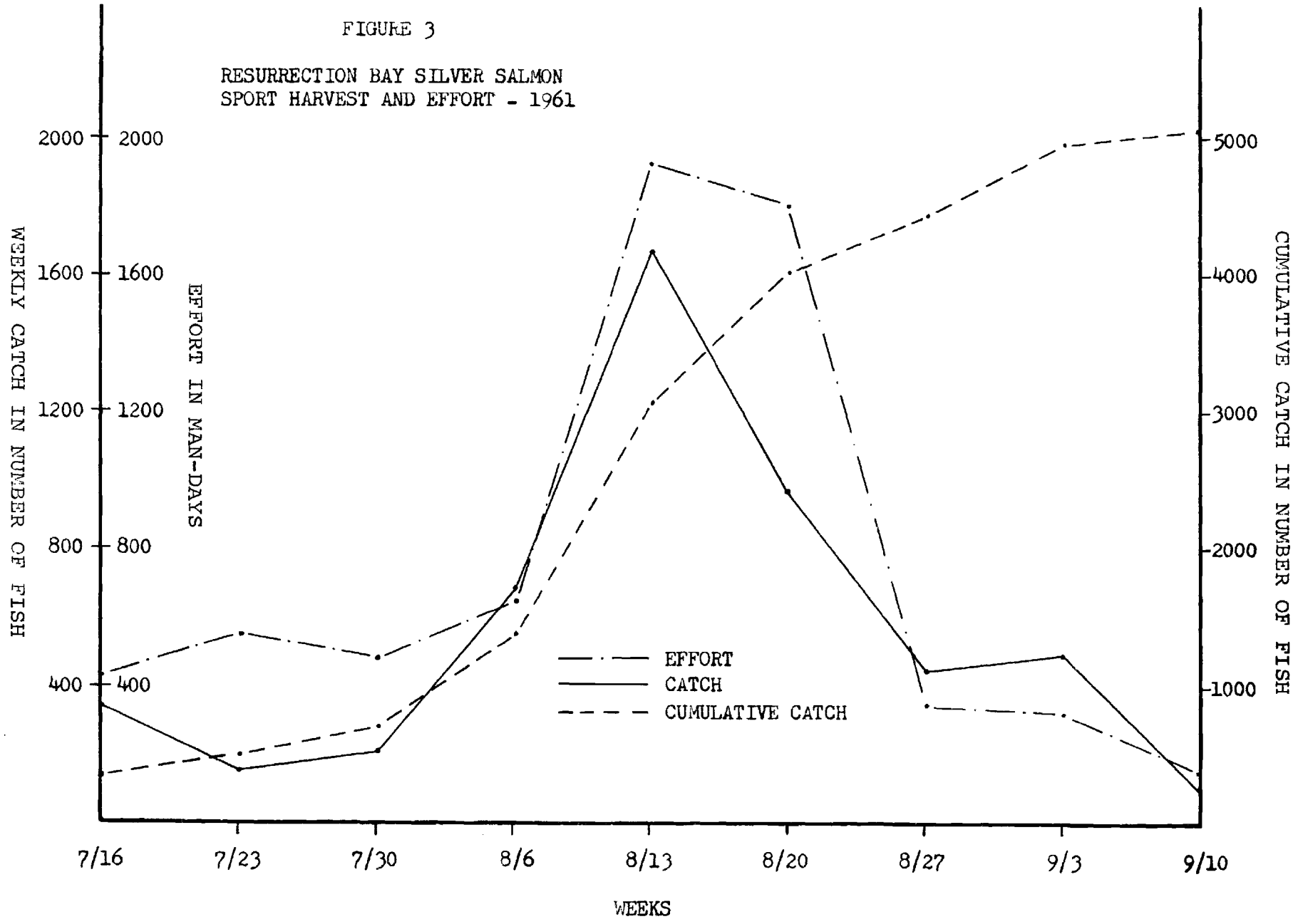


FIGURE 3

RESURRECTION BAY SILVER SALMON
SPORT HARVEST AND EFFORT - 1961



short period. The catch per hour averaged 0.10 but improved slightly in the first part of September when the fish were schooled at the head of the Bay prior to ascending the streams.

The reported commercial catch based on fish tickets from canneries was 1,332 fish. The commercial harvest was taken chiefly by purse seiners and it is believed to be a less accurate estimate than the sport catch.

The total sport fishing effort was estimated at 6,002 man-days. The heaviest fishing pressure (75.1%) was concentrated on weekends. It was found that 84.8 percent of the fishermen interviewed were not Seward residents and that most of these were weekend fishermen from the Anchorage area. The anglers interviewed had fished an average of 3.7 years in Resurrection Bay which again probably reflects the influence of the Silver Salmon Derby which was initiated in 1956. Analysis of the 1,140 creel census cards dispensed showed that 62.5% were returned. The percentage of cards returned on weekends was slightly higher (10.7) than on weekdays. Of the cards returned 62.5% had fish recorded and 37.5% had zero catches indicating that many unsuccessful fishermen completed the census cards. Only 2.6% of the returned cards came through the mail while the rest were placed in the boxes on the docks or given to the census clerks. Nearly all salmon fishing was done from boats. Some minor beach fishing occurred during the early part of September. No measurement was made of beach fishing effort or catch. The mean number of fishermen per boat was 2.5 and the majority (88.9%) of the boats were outboard powered. A higher percentage of anglers preferred bait (71.4) rather than lures (28.6). Herring was the most popular bait.

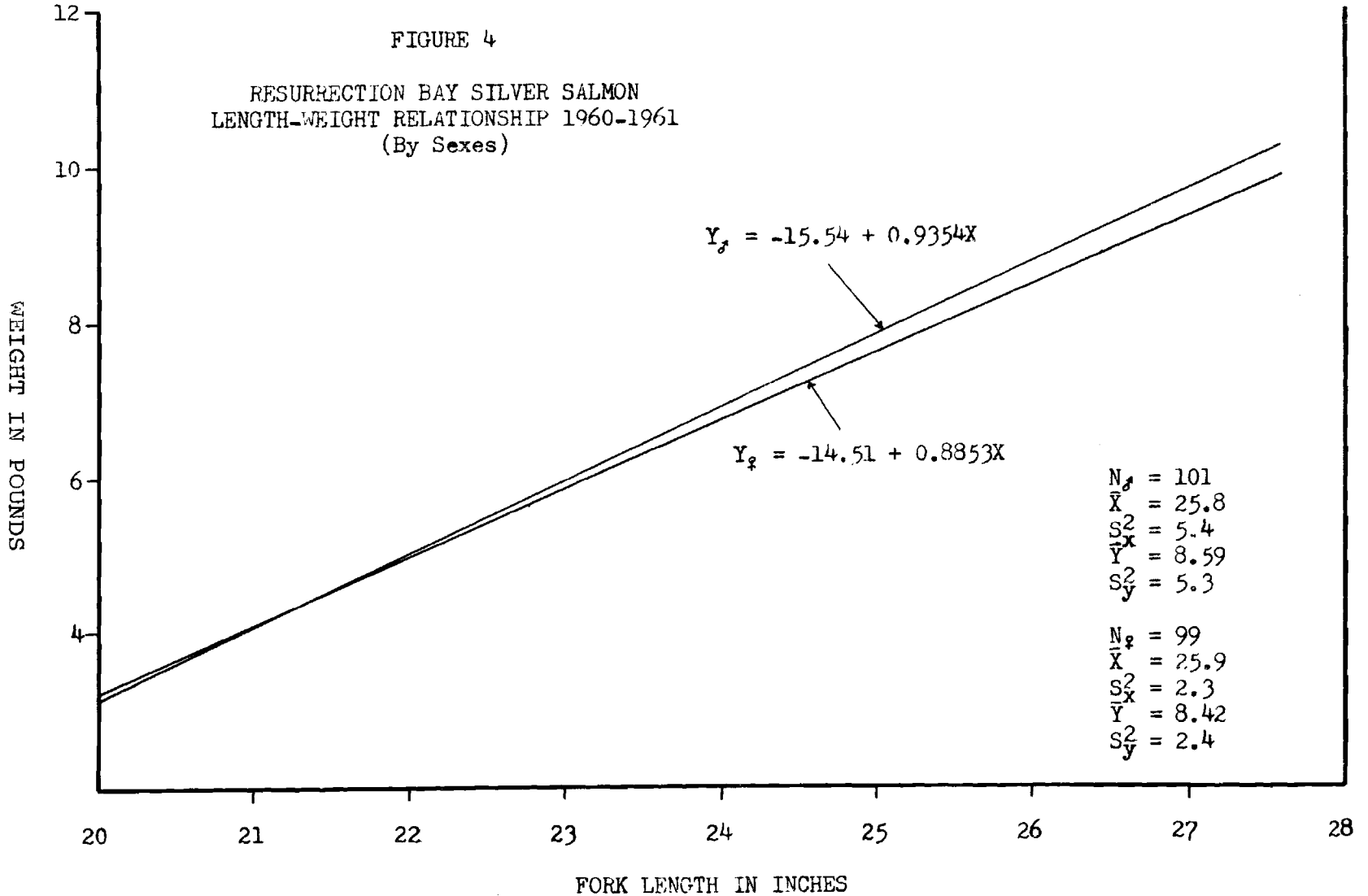
The weights, fork lengths, and sex ratios from silver salmon collected in Resurrection Bay during 1960 and 1961 are:

	Number	Mean weight	Range	Mean fork length	Range
Males	101	8.59	4.0-13.9	25.8	19.9-30.5
Females	99	8.42	4.5-11.4	25.9	21.4-28.4

The length-weight relationship for 200 silver salmon by sexes is presented in Figure 4.

FIGURE 4

RESURRECTION BAY SILVER SALMON
LENGTH-WEIGHT RELATIONSHIP 1960-1961
(By Sexes)



The Bear Lake system was selected for more intensive study because it has comparatively stable stream flows, clear water, and is a known silver salmon rearing area. Bear Creek, the only outlet, is 2,130 yards in length with a mean width of 10 feet. The estimated summer flow is 12 cfs. Bear Lake was icebound from November 7 to May 2, with 31 inches being the thickest ice cover recorded.

The present weir is located near the confluence of Bear Creek with Salmon Creek. It is constructed of wood and is 28 feet long and 3 feet high. The weir was completed on June 25 and operated continuously until November 14 when ice and snow conditions made further operations impractical. The distance between the weir slats (three-fourths of an inch) allowed most fish under eight inches (fork length) free passage. If screens had been employed instead of wooden slats all fish could have been stopped but due to the large number of leaves falling into the stream concomitant with high water it would have been impossible to keep the screens clean. Construction on the weir was completed too late in the season to obtain any data on the timing and abundance of silver salmon smolt or similar data on the spring egress of other species from Bear Lake.

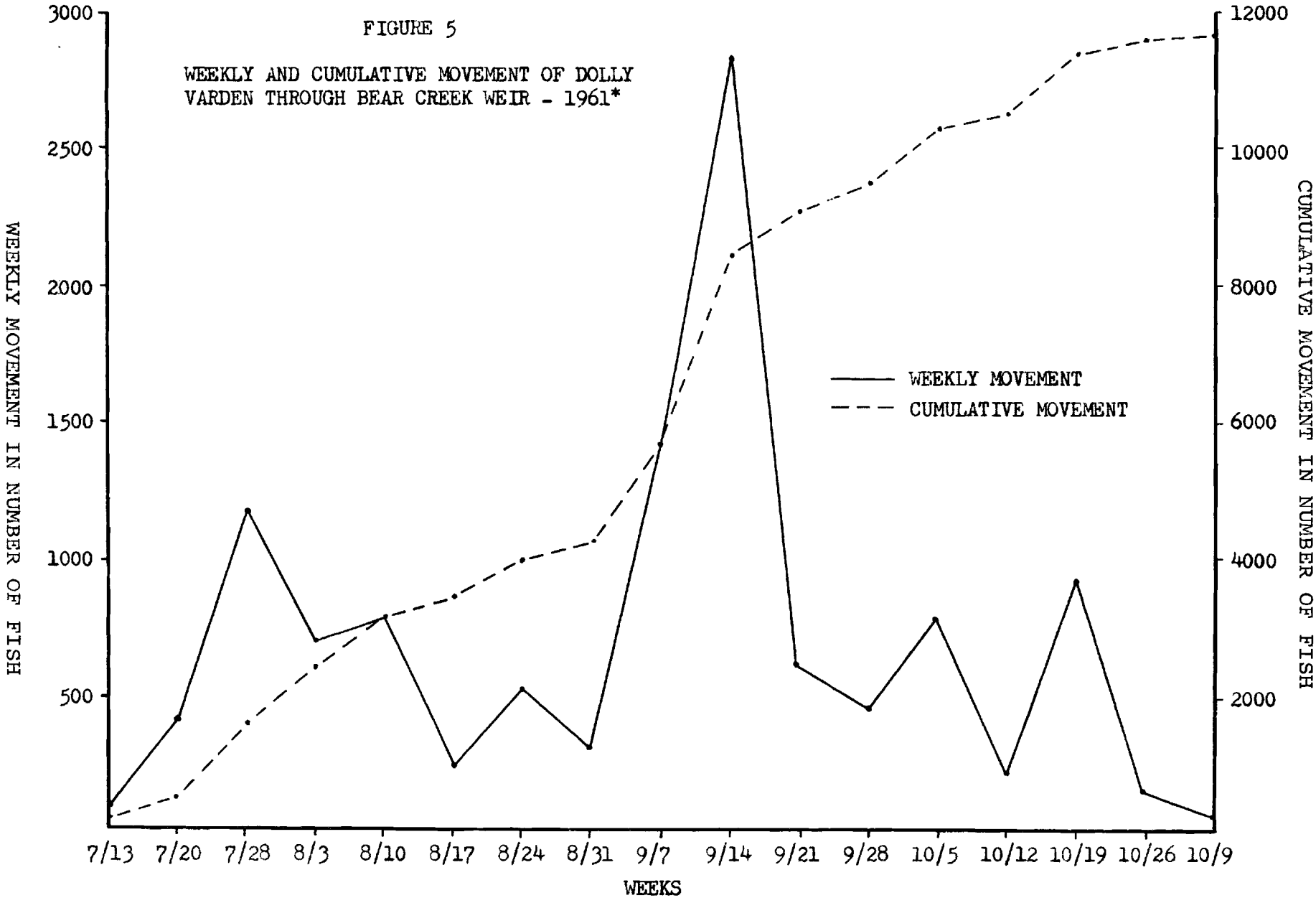
Red salmon are the first species to migrate into Bear Lake. A total of 1,451 adults were counted at the weir. It is estimated that the run was approximately two-thirds over by the time the weir was completed. Red salmon move into Bear Lake where they spawn on the shoal areas. The weights and fork lengths from the red salmon measured at the Bear Creek weir are:

	Number	Mean weight	Range	Mean fork length	Range
Jacks	23	1.17	0.69-1.82	13.6	11.8-15.2
Males (excluding jacks)	6	4.81	3.69-6.12	22.1	20.2-24.5
Females	18	4.42	3.19-5.69	21.8	20.5-23.0

Dolly Varden, the most numerous salmonid species, first moved upstream to the weir on July 6. The peak of the run occurred on September 10 when 1,103 fish were counted through. Their movements were irregular. Cumulative movement is presented in Figure 5. The total number of Dolly Varden counted through the weir was 11,611. On November 14 when the panels were removed an estimated 2,000 were schooled in Salmon Creek

FIGURE 5

WEEKLY AND CUMULATIVE MOVEMENT OF DOLLY VARDEN THROUGH BEAR CREEK WEIR - 1961*



* - An estimated 2000 fish moved up Bear Creek after weir removal on 11/14.

below the weir. To determine the destination of these fish 497 were captured using an electric shocker and marked by clipping the lower lobe of the caudal fin. Some of these fish were later recovered in Bear (274) and Grouse (6) lakes by a commercial gill net fishery. From the above returns it appears that most of the Dolly Varden remaining in Salmon Creek after the weir was removed migrated into Bear Lake. The commercial fishery removed 8,027 Dolly Varden from Bear Lake and 1,117 from Grouse Lake. The weights and fork lengths from the Dolly Varden measured at the Bear Creek weir by months are:

Month	Number sample	Mean weight	Range	Mean fork length	Range
July	88	0.76	0.22-3.44	11.9	8.2-20.9
August	99	0.87	0.22-3.77	12.6	7.9-21.9
September	139	0.94	0.37-2.71	13.6	9.4-20.6
October	101	1.12	0.41-2.74	15.1	10.5-20.0

The length frequency data for these fish is presented in Table 2. From September 29 to October 17 a total of 104 fish were examined for maturity. It was observed that nearly all the fish (97.2%) had spawned prior to reaching the weir. The sex, weights and lengths of these mature Dolly Varden are:

	Ripe	Spent	Mean weight	Range	Mean length	Range
Males	2	27	1.33	0.48-2.71	15.8	11.5-20.6
Females	1	74	1.36	0.44-3.52	16.4	11.3-23.1

The stomachs of 107 Dolly Varden were examined from January and February gill net catches at Bear Lake. These fish averaged 16.2 inches fork length (range 12.3 to 20.4). All stomachs examined were empty except one from a 15.6 inch fish which contained two sculpins. Sex was determined for 901 Dolly Varden. The sex ratio was 1 male to 1.82 females.

The first adult silver salmon moved through weir on August 22, although the peak of the run did not occur until October 2 when 401 fish were counted. This large movement occurred during high stream flows due to a prolonged period of rain. Foot surveys noted any movement into the stream after weir removal on November 14. Within two days after the panels were removed an estimated 200 silver salmon moved into Bear Creek. The total run in this stream including the estimated fish was 972. The weekly and

TABLE 2.

LENGTH FREQUENCY OF DOLLY VARDEN
COLLECTED AT BEAR CREEK WEIR IN 1961

Fork length (in inches)	Months			
	July	August	September	October
7.1-8.0	-	1	-	-
8.1-9.0	3	2	-	-
9.1-10.0	8	5	4	-
10.1-11.0	32	19	14	2
11.1-12.0	17	22	33	9
12.1-13.0	8	16	22	15
13.1-14.0	4	8	17	11
14.1-15.0	5	8	11	12
15.1-16.0	3	6	11	14
16.1-17.0	4	4	12	11
17.1-18.0	2	4	7	15
18.1-19.0	1	2	4	6
19.1-20.0	-	-	2	6
20.1-21.0	1	1	2	-
21.1-22.0	-	1	-	-
Total	88	99	139	101

cumulative silver salmon movement is shown in Figure 6.

The period of silver salmon spawning was determined by foot surveys and examination of carcasses floating downstream and collecting on the weir. Time of spawning extended from October 15 to December 15.

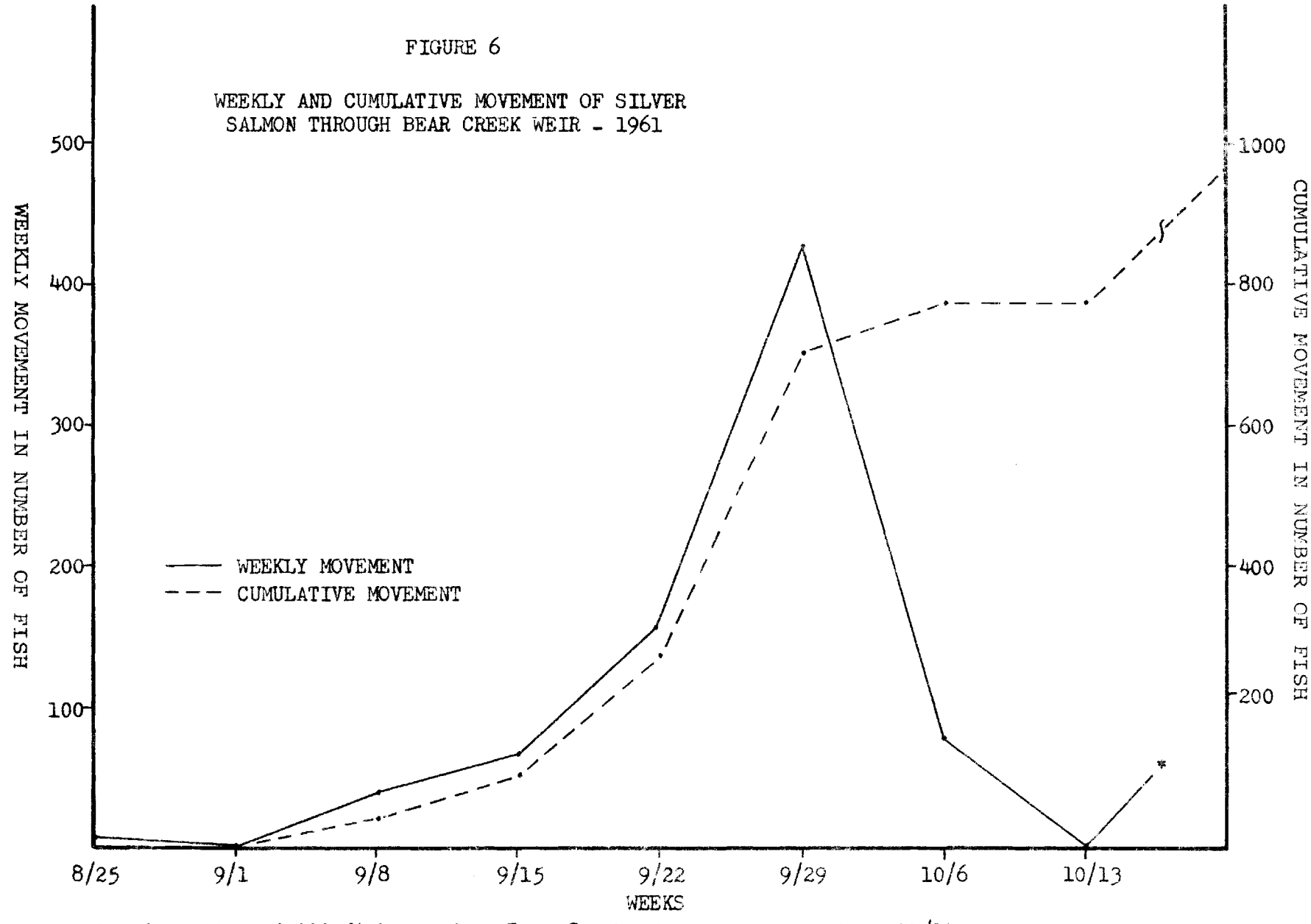
Juvenile silver salmon upstream and downstream movement was observed through the weir during the period of operation. No estimate of abundance was obtained due to the distance between the weir slats.

Other species counted through the weir included ten pink salmon, two chum salmon, and six steelhead. Sculpins and the threespine stickleback also reside in the stream.

The minimum escapement for all streams surveyed is presented in Table three. Foot surveys were also made on Tonsina and Spruce Creeks which are tributaries to Resurrection Bay, but no silver salmon were observed. These are glacial streams which support other species but are nearly dry when silver salmon could use them. It appeared that Dairy Creek had over escapement for the spawning gravel available. In this stream, 19 percent of all dead salmon observed had died without spawning. Dairy Creek is located within the city limits of Seward. The number of unspawned fish was negligible in the other streams. Where comparisons are available, escapements were smaller than in 1960 and it appears that in most streams there was spawning area available for more fish. The escapement into Grouse Creek during 1961 was 24 fish. A weir count of 758 was made by the FWS on this stream in 1925. This decline may be due in part to the construction of the Seward Highway, which resulted in realignment of the stream channel and removal of cover and pools. It is believed that the largest silver salmon run occurs in the Resurrection River, but measurement is difficult because the stream is glacial. In the late fall, with the advent of freezing temperatures, the river cleared and limited aerial surveys were made. Aerial surveys at this time are very difficult because of frequent inclement weather, high winds, and the low angle of the sun. The 113 fish enumerated by air are believed to be only a fraction of those actually in the stream. Sampling with electrofishing gear and gill nets provided no data on either timing or abundance. Because of this major unknown, no estimate of total escapement can be made.

FIGURE 6

WEEKLY AND CUMULATIVE MOVEMENT OF SILVER SALMON THROUGH BEAR CREEK WEIR - 1961



* - An estimated 200 fish moved up Bear Creek after weir removal on 11/14.

TABLE 3.

MINIMUM ESCAPEMENT DETERMINATIONS

FOR SILVER SALMON IN 1961

Name of Stream	Number of Surveys	Date first observed	Last date of survey	1961 Escapement	1960 Escapement
Airport Creek	8	8/28	11/16	162	381
Bear Creek	Weir	8/22	11/18	972	-
Clear Creek	8	9/29	11/16	96	267
Dairy Creek	8	10/13	11/16	249	-
Grouse Creek	3	10/19	11/19	24	105
Jap Creek	7	10/4	11/17	91	127
Mayor Creek	2	10/16	10/21	21	-
Resurrection River	3	9/26	10/17	113	700
Salmon Creek	2	10/20	11/15	69	-
Sawmill Creek	1	10/12	10/12	6	-

Prepared by:

Sidney M. Logan
Fishery Biologist

Approved by:

Richard Haley
D-J Coordinator

Alex H. McRea, Director
Sport Fish Division